Guru Gobind Singh Indraprastha University

University School of Information, Communication and Technology (USICT)

Sector 16C, Dwarka, New Delhi 110078

Report on Collaborative Agricultural Research: Weather-Based Spray Prediction Model for Aonla Rust Disease Using Machine Learning

Date of report: 1 November 2026

1. Background

Aonla (Indian gooseberry, Emblica officinalis) is an important fruit crop in Uttar Pradesh, valued for its nutritional and medicinal qualities. Rust disease affects both the leaves and the fruit of Aonla and causes significant losses in yield and fruit quality. Farmers often spray fungicides without knowing whether the weather is favourable for the disease, which adds to their costs and can harm the crop. The University School of Information, Communication and Technology (USICT), Guru Gobind Singh Indraprastha University, Delhi, worked with agricultural institutions to use long-term field weather and disease records to develop a machine learning model that predicts the days on which fungicide spraying is needed.

2. Study details

Study	Partner institutions	Research team	Publication
Spray Prediction Model for Aonla Rust Disease Using Machine Learning Techniques	Acharya Narendra Deva University of Agriculture and Technology (ANDUAT), Ayodhya ICAR-Central Institute for Arid Horticulture (CIAH), Bikaner ICAR-Indian Agricultural Research Institute (IARI), New Delhi USICT, GGSIPU, New Delhi	Hemant Kumar Singh and Bhanu Pratap (ANDUAT) S. K. Maheshwari (ICAR-CIAH) Ayushi Gupta, Prof. Anuradha Chug and Prof. Amit Prakash Singh (USICT, GGSIPU) Dinesh Singh (ICAR-IARI)	Journal of Agricultural Science and Technology B, Vol. 13 (2023) DOI: 10.17265/2161-6264/2023.01.001

3. Field data collection

Period	Place	Data collected	Crop
2004–2020 (excluding 2016)	Main Experiment Station, Horticulture, ANDUAT, Kumarganj, Ayodhya, Uttar Pradesh	Aonla variety NA-7 (Narendra Aonla-7) grown in field plots; weekly weather records (maximum and minimum temperature, morning and evening humidity, rainfall and sunshine) and expert scoring of rust disease, from standard meteorological weeks 35 to 52 each year	Aonla

Over 16 years, 288 weekly records were compiled. Weeks in which rust appeared were marked as favourable (conducive) for the disease, and the rest as not favourable.



Figure 1. Agro-meteorological observatory at ANDUAT, Kumarganj, Ayodhya, where the weather data were recorded.



Figure 2. Weather recording instruments at the observatory used for the field data.

4. Work carried out

- **Field weather and disease records:** weekly weather data and rust disease scores from the Aonla field plots at ANDUAT were brought together into a single dataset.

- **Spray prediction models:** several machine learning models were trained to tell, from the week's weather, whether conditions were favourable for rust, and therefore whether a fungicide spray was needed.
- **Comparison and selection:** the models were compared, and the most reliable one was selected for use in spray advisories.

5. Outcomes

The best model identified weather conditions favourable for Aonla rust with an accuracy of 94.6% (Figure 3). Such a model can support advice to spray fungicide only when the weather favours the disease, helping to protect the crop while avoiding unnecessary sprays. To the team's knowledge, this is the first machine learning study on Aonla rust. Planned next steps include a mobile application for spray prediction and a model that also estimates how severe the disease is likely to be.

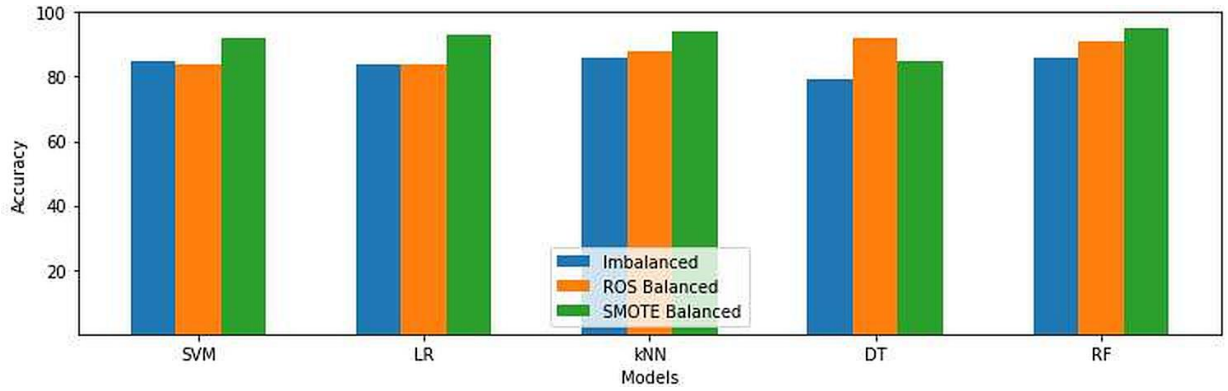


Figure 3. Accuracy of the spray prediction models compared in the study; the best model reached 94.6%.

6. Contribution to the Sustainable Development Goals

The work is aligned with the following goals. These describe the intended direction of the research rather than measured impacts.

SDG and target	How the work contributes
SDG 2: Zero Hunger (2.4)	Timely, weather-based spray advice can help reduce yield losses from rust and support sustainable fruit production.
SDG 9: Industry, Innovation and Infrastructure (9.5)	The study applies machine learning to long-term field records, building research capacity in AI for horticulture.
SDG 12: Responsible Consumption and Production (12.4)	Spraying only on days favourable for the disease can help avoid unnecessary use of fungicides.
SDG 13: Climate Action (13.1)	Sixteen years of weather and disease records help in understanding how weather conditions drive crop disease.
SDG 17: Partnerships for the Goals (17.17)	The work brings together GGSIPU, ANDUAT, ICAR-CIAH and ICAR-IARI, combining computing, horticulture and plant pathology expertise.

Prof. Amit Prakash Singh, Professor, USICT
Prof. Anuradha Chug, Professor, USICT
Prof. Udayan Ghose, Dean, USICT
Guru Gobind Singh Indraprastha University, Sector 16C, Dwarka, New Delhi 110078